

### REMARKS

Claims 64-65, 67-83, 85, 87-89 and 130-136 have been amended. Claims 66, 84 and 86 have been canceled. Claims 157- 161 are new. No new matter is added. Re-examination and reconsideration are requested.

In the office action, dated November 2, 2005, the examiner rejected claims 64-66, 69-70, 72-73 and 76 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,540,870 ("Quigley"). The examiner rejected claims 64-67, 69-70, 72-74, 76, 78-79, 81-82, and 84-86 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,568,072 ("Wilemon"). The examiner rejected claims 64-65, 72-73, and 76 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 3,717,720 ("Snellman").

Further, the examiner rejected claims 67-68, 71, 75, 77-86, 130, 132-134 and 136 under 35 U.S.C. §103(a) as being unpatentable over Quigley.

#### I. The Claims

Claims 64, 78, 130 and 134 have been amended to clarify that the resin matrix materials embed the fibers to form the core and further, that the first layer or section of the core does not comprise glass fibers. Support for these amendments may be found in the specification, in particular, paragraph [0031]. In particular, "First, matrix materials embed the fibers. In other words, the matrix bundles and holds the fibers together as a unit – a load member. The matrix assists the fibers to act as a single unit to withstand the physical forces on the ACCC cable." See [0031]. In essence, the composite core is comprised of a plurality of fibers having a high tensile strength surrounded by a plurality of different fibers having low stiffness properties, and a resin embeds the fibers to form the composite core. The arrangement of the fibers, that is, high

strength surrounded by low stiffness contributes to the desired end characteristics of the composite core.

Further support for the claim amendments may be found in [0060]. In particular, "The composite core can be designed having an inner strengthening core member comprising a high-strength composite surrounded by an outer low-stiffness layer. The high-strength composite can have a greater than 50% volume fraction and mechanical properties exceeding the mechanical properties of glass fibers. The outer layer of low-stiffness composite can have mechanical properties in the range of glass fiber. The mechanical properties of fibers similar to glass fibers can add flexibility to the composite core." See [0060]. In addition, see [0061], "[f]ibers forming the first layer of a high-strength composite can be selected with a tensile strength within the range of about 350 Ksi to about 750 Ksi." The low stiffness layer is described in [0062].

Further support for a cured matrix may be found in paragraph [0046]. In short, according to various embodiments, the resin embeds the fibers and the resulting fiber/resin matrix is cured to form the core. "In the present invention, individual fibers can be oriented, coated with resin, and cured to form a composite core member having 100% packing efficiency." See [0046].

According to the foregoing, no new matter was added.

## II. Rejections under 35 U.S.C. §102(b):

### A. Legal Standard

The standard for anticipation under 35 U.S.C. §102, is one of strict identity. A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim. *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, (Fed. Cir. 1987). That is, to anticipate a claim for a patent, a single prior art source must contain all the essential elements of the patent claim. *Hybritech, Inc. v. Monoclonal Antibodies*,

*Inc.*, 231 USPQ 81, 90 (Fed. Cir. 1986). Invalidity for anticipation requires that all the elements and limitations of the claims be found within a single prior art reference. *Scripps Clinic & Research Found. V. Genentech, Inc.*, 18 USPQ2d 1001 (Fed. Cir. 1991). Moreover, “any degree of physical difference, however slight, invalidates claims of anticipation.” *E.I. du Pont de Nemours & Co. v. Polaroid Graphics Imaging Inc.*, 10 USPQ2d 1579, 1585 (D. Del. 1989), *aff’d*, 13 USPQ2d 1731 (Fed. Cir. 1989). Furthermore, for a reference to anticipate, the elements must be arranged as required by the claim. *In re Bond*, 910 F.2d 831 (Fed. Cir. 1990).

#### B. Reply

The examiner rejected claims 64-66, 69-70, 72-73 and 76 because “Quigley teaches a structural member of fiber reinforced composite material comprising a multi-ply tube or rod formed with an outer sheath of fiber reinforced thermoplastic material and an inner core material, also of fiber reinforced thermoplastic.” As stated above, strict identity is required between all the elements of the claims in the present application and the description of any apparatus disclosed by Quigley. Such strict identity does not exist.

Quigley discloses a layered multi resin system that enables secondary reformation of the structural element. All of the claim elements of Applicant’s claim 64 as amended are not disclosed by Quigley. As amended, claim 64 requires a cured matrix. Not only does Quigley not disclose this element, to the contrary, Quigley requires only a partially cured element. To enable structural reformation, the structural member is not completely cured; rather the element is cured to a “B” condition to allow for further deformation upon application of appropriate heat. B-stage is a term used in the composites industry for incomplete curing. For example, B-stage is “intermediate stage of curing. Not yet fully cured. Will not flow, but will yield to pressure. See, [www.jamestowndistributors.com/decoder\\_masglossary.asp](http://www.jamestowndistributors.com/decoder_masglossary.asp). Further, [B-stage] is “the partially

~~crosslinked form~~ of a thermosetting resin. This curing stage is used in prepreg materials to facilitate storage and transport before final processing." See, [www.torayusa.com/cfa/terminology.html](http://www.torayusa.com/cfa/terminology.html). Once a composite is fully cross-linked or cured the composite does not allow for secondary reformation. Therefore, Quigley does not disclose a cured composite.

Claim 64, as amended, further requires that the fibers of the first layer and the at least one other layer are embedded in a resin to form the core member. That is, the core comprises a single resin system that embeds the plurality of fibers; the resin having one melting point. Quigley does not disclose this element. Indeed, in order to allow secondary reformation, Quigley discloses using multiple layers whereby the materials of these layers are selected such that the melting points of the outer layers are higher than those of the inner layers, "so that [the middle layer] is a fluid captured between the core layer and the outer sheath." Col. 4, line 4. "The materials of these layers are selected such that both  $t_{m1}$  and  $t_{m3}$  represent higher melting points than  $t_{m2}$ ." Therefore, Quigley does not disclose a unitary matrix that holds the fibers together as a unit or a load member; rather, layers of separate matrix systems wherein each layer contributes to secondary reformation. Because Quigley does not disclose at least two limitations of claim 64, strict identity has not been established.

For these reasons, the examiner has failed to establish a prima facie case of strict identity between the disclosure of Quigley and the claims of the present invention. Dependent claims 65-66, 69-70, 72-73 and 76 are allowable because they depend from claim 64, which is prima facie allowable.

The examiner rejected claims 64-67, 69-70, 72-74, 76, 78-79, 81-82, and 84-86 because Wilmon teaches "a reinforced conductor core comprising a plurality of filaments encased in a

polymer and a layer of carbon fibers coated with polymer surrounding the composite reinforced conductor.” As previously stated, strict identity is required between all the elements of the claims in the present application and the description of any apparatus disclosed in Wilemon. Strict identity further requires that the elements disclosed in Wilemon be arranged as required by the claim. Such strict identity does not exist.

Notwithstanding that Wilemon does not disclose every element as claimed by Applicant, Wilemon discloses a different concept. Traditional aluminum conductor steel reinforced cable (ACSR) is formed from a set of twisted aluminum conductors wrapped around a core of steel wires. Claims 64 and 78 require a composite core for an electricity transmission cable, the composite core comprising a plurality of fibers embedded in a resin to form the core. That is, the composite core replaces the traditional steel core found in aluminum conductor steel reinforced cables. In stark contrast, Wilemon discloses an aluminum conductor core surrounded by reinforced fibers. More specifically, Wilemon teaches reinforcing the conductor by substituting the steel core for a multiplicity of individual conductors collected into a bundle, wherein the bundle is further surrounded by: a first layer of carbon and grease, a next layer of filament and catalyzed polymer, and a next layer of carbon fibers and conductors in an overlying layer of catalyzed polymer. See Col. 3, Line 52.

The ordering of elements differs from that claimed by Applicant. Applicant claims a reinforcing composite core for an electricity transmission cable wherein, the conductor may further be stranded around the core, i.e., the conductor is exterior to the core. Therefore, Wilemon discloses a conductor core not a composite core as required by claims 64 and 78. Because Wilemon does not disclose all the limitations of Applicant’s claims, anticipation has not been established.

For these reasons, the examiner has failed to establish a prima facie case of anticipation between the disclosure of Wilemon and the claims of the present invention. Dependent claims 65-67, 69-70, 72-74, 76, 79, 81-82 and 84-85 are allowable because they depend from claims 64 and 78 respectively, which are prima facie allowable. Claim 86 has been canceled.

The Examiner has further rejected claims 64-65, 72-73 and 76 because Snellman teaches "a composite core for composite core reinforced cable, said composite core comprising an impregnated glass fiber cable. The cable comprises a plurality of individual glass fiber rovings twisted together which are impregnated with a resin, wherein additional layers are laid on the initial rovings in concentric layers." Snellman does not disclose each and every element of claim 64.

Snellman teaches a "primary tensile strength member compris[ing] a homogeneous glass fiber cable which constitutes a dielectric core for a layer or layers of a metal of low density and good electrical conductivity such as aluminum or an aluminum rich alloy." See Column 2, line 12. Snellman uses the word homogenous in conjunction with glass fibers. The word homogenous means "uniform in structure or composition throughout". See [www.dictionary.com](http://www.dictionary.com). By definition, there can be no alternate fiber type or more than one fiber type.

Applicant's claims as amended require that the fibers of the first layer have a modulus of elasticity that exceeds that of glass fibers. As such, these fibers by definition cannot be glass fibers. Because Snellman discloses use of glass fibers only, Snellman cannot anticipate. Accordingly, the examiner has failed to establish anticipation between the disclosure of Snellman and the claims of the present invention. Dependent claims 65, 72-73, and 76 are allowable because they depend from claim 64, which is prima facie allowable. New claims 157-

161 are allowable because they contain the limitation that at least one fiber type comprise a modulus of elasticity in excess of glass fibers.

### III. Rejections under 35 U.S.C. § 103(a)

#### A. Legal Standard

The examiner has the burden of establishing a prima facie case of obviousness. *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998). “When a rejection [under 103] depends on a combination of prior art references, there must be some teaching, suggestion or motivation to combine the references.” *Eccolochem, Inc., v. So. California Edison Co.*, 227 F.3d 1361, 1372 (quoting *In re Rouffet*, 149 F. 3d 1350, 1355 (Fed. Cir. 1998)). “Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. *Id.*, 227 F. 3d at 1372 (quoting *ACS Hosp. Sys. Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984)).

References “teach away” when person of ordinary skill, upon examining the reference, would be discouraged from following the path set out in the reference, or would be led in a direction different from the path that was taken by the patentee. 35 U.S.C.A. § 103. One of ordinary skill in the art “is also presumed to be one who thinks along the lines of conventional wisdom in the art and is not one who undertakes to innovate, whether by patient, and often expensive, systematic research or by extraordinary insights.” *Standard Oil Co. v. Am. Cyanamid Co.*, 227 USPQ2d 293, 298 (Fed. Cir. 1985). And, that “showing must be clear and particular.” *In re Dembiczak*, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). References that teach away may not be used as the basis for an obviousness rejection. *Id.*

#### B. Reply

The Examiner rejected claims 67-68, 71, 75, 77-86, 130, 132-134 and 136 under 35 USC 103(a) as being unpatentable over Quigley. However, the examiner failed to meet her prima facie burden to establish obviousness for the reasons stated below.

The examiner argues that Quigley teaches that the "fiber materials that are employed in his invention include glass fibers and carbon fibers." See column 1, lines 45-49. It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a fiber reinforced composite material using a first fiber type for the solid core and a second fiber type in the surrounding concentric second layer commensurate with the desired properties of the end product."

Applicant initially notes that, as discussed above, the Quigley reference does not anticipate Applicant's claimed invention. Unpatentability for anticipation under 35 U.S.C. § 102(b) requires that all of the elements and limitations of the claim be found within a single prior art reference. *Carella v. Starlight Archery and Pro Line Co.*, 804 F.2d 135, 138, 231 USPQ 644, 646 (Fed. Cir. 1986); *RCA Corp. v. Applied Digital Data Systems, Inc.*, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984). To establish a prima facie case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Even if Quigley disclosed all of the elements in 78, 130 and 134, the Quigley disclosure does not reconstruct Applicant's invention as claimed in currently amended independent claims 78, 130 and 134.

a. The Prior Art Reference Does Not Teach All Of The Claim  
Limitations

As discussed, Quigley teaches incomplete curing to enable secondary reformation of the composite product. In particular, "both layers, in the two layer construction, or all three layers in



the three layer construction, must be reformable during secondary processing, by being a thermoplastic material, or thermoset material which as been cured to the "B" state, rendering it not fully cross linked and reformable upon the application of heat." In order to reform the member, the temperature is selected such that the temperature is high enough to render the outer sheath and the inner core malleable.

Quigley discloses a structural element fabricated with an outer sheath that functions as a mold to the inner core. This is achieved by forming layers of composites, the layers of composite each having different resin systems with different melting temperatures. According to the invention, in order for Quigley to achieve reformation of the composite into selected shapes, the layers must comprise materials having different melting points. "Each of the layers may be rendered malleable upon further heating and permanently fixed in shape upon cooling. The materials of these layers are selected such that both  $t_{m1}$  and  $t_{m3}$  represent higher melting points than  $t_{m2}$ ." Col. 3, line 65.

Claims 78, 130 and 134 recite a composite core wherein the fibers are embedded within one resin system throughout the core. That is, the resin system comprises the same melting temperature throughout the matrix. In short, Quigley does not disclose using a uniform resin system nor does Quigley disclose curing the product to a fully cross-linked state. As such, Quigley does teach all of the claim limitations.

b. There is no Suggestion or Motivation to Modify the Reference

The teachings of Quigley could not be adapted to make the invention disclosed by Applicant. Quigley clearly states, "It is an object of this invention to provide a structural element of fiber reinforced composite material which is suitable for secondary processing to change its geometric shape and configuration in a secondary processing step." Col. 1, line 58. Moreover,

in Quigley “[all layers] must be reformable”. Col. 2, line 57. To aid in reformation, Quigley further teaches that the fibers may be allowed to move. “The fibers may be positioned such that the orientation of the fibers prior to secondary processing may be quite different from that after secondary processing. In secondary processing the fibers may be allowed to move, to change angular orientation with respect to one another, in order to provide more uniform strength in bends and curves.” Col. 4, line 41.

Reformation, including reorientation of the fibers, would adversely affect the strength of the composite core. The strength of the composite core can be attributed to both the selection of the components of the core and the manufacturing process. The fibers in particular, play an important role in determining the end characteristics of the composite core. For example, while some fibers offer strength others may offer flexibility. Accordingly, the fibers are selected and arranged prior to processing in accordance with the desired end characteristics of the composite core. For example, a carbon/glass composite core comprises high strength carbon fibers surrounded by glass fibers to provide increased flexibility. In addition, the outer layer of glass fibers effectively isolate the carbon fibers from the conductor to minimize the possibility of a galvanic reaction between the carbon fibers and the aluminum conductor. Therefore, the configuration of the fibers is determined prior to the fibers embedding in the resin. Moreover, once the fibers are processed through the die system, the matrix is cured and the fibers cannot reconfigure.

In one example in the specification, “the components of the core are selected based on desired composite core characteristics. One advantage of the present process is the ability to adjust composite components in order for a composite core to achieve the desired goals of a final ACCC Cable...[p]erformance can be improved by forming a core with increased strength and

stiffness, coupled with a more flexible outer layer.” See [0081] In addition, “fiber tow passageways are arranged to provide a configuration for formation of a core composite sections having an inner carbon core and outer glass layer. The carbon layer is characterized by high strength and stiffness and is a weak electrical conductor whereas the outer low modulus glass layer is more flexible and non-conductive. Having an outer glass layer provides an outer insulating layer between the carbon and the high conductivity aluminum wrapping in the final composite conductor product.” [0082] Accordingly, the configuration of the core is determined based on the desired physical characteristics of the core and the guidance system prevents reformation, which would affect the properties of the core.

In contrast, the resin system in Quigley is selected according to its melting point in order to aid in reformation. Indeed, the structural element is fabricated with an outer sheath comprising a resin that has a different melting temperature than the layer sandwiched between the inner core and the outer sheath. Therefore, to reform the element, heat is applied sufficient to melt the material between the core and the sheath while the core and the sheath become deformable but not fluid. See Col. 2, line 20. This can only be achieved by employing a composite material characterized by a matrix melting temperature which is significantly lower than the melting temperature of the material forming the outer sheath and the inner core. Col. 2, line 25.

The Quigley patent effectively teaches away from using a resin system having one melting point. “A reference may be said to teach away when a person of ordinary skill, upon reading the reference...would be led in a direction divergent from the path that was taken by the applicant.” *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999). Quigley specifically teaches a multiple resin system wherein “the materials of these layers are

selected such that both  $t_{m1}$  and  $t_{m3}$  represent higher melting points than  $t_{m2}$ . In contrast, the present invention requires a resin system selected to produce a composite core that meets or exceeds predetermined values for the coefficient of thermal expansion, modulus of elasticity and tensile strength. Therefore, Quigley teaches away from this limitation by stressing that the layers are characterized by their different melting temperatures. See col. 2, lines 25-30. Because Quigley teaches away from the present invention, it cannot be used as the basis for an obviousness rejection.

Therefore, the examiner has failed to carry her prima facie burden to prove obviousness because: 1) Quigley does not disclose all the elements of claims 78, 130 and 134; 2) even if Quigley did disclose all elements, Quigley could not be adapted to construct Applicant's invention; and 3) Quigley teaches away from the present invention and cannot be used as the basis for an obviousness rejection.

Dependent claims 67-68, 71, 77, 79-85, 132-133 and 136 are allowable at least because they depend from either claim 64, 78, 130 or 134 which are allowable at least for the reasons set forth above. Claim 86 has been canceled.

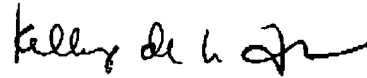
#### IV. Double Patenting Rejection

Applicant has amended claim 77 and believes this overcomes Examiner's double patenting rejection.

Applicants believe that all of the claims now pending in this patent application are allowable and that the issues raised by the examiner have been addressed. Therefore, applicants respectfully request the examiner to reconsider and remove her rejections and to grant an early allowance. If any questions or issues remain to be resolved, the examiner is requested to contact the Applicants' attorney at the telephone number listed below.

Respectfully Submitted,

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